support a 500 MHz downlink. Alternatively, in a situation involving a total of 300 MHz of available spectrum, 200 MHz could be used by the spot beams, effectively yielding 400 MHz available bandwidth, while the other 100 MHz could be utilized as a CONUS coverage beam, thereby providing a total of 500 MHz.[56]

C. Efficient Utilization of Bandwidth

The standard practice today is to use QPSK as both the uplink and downlink modulation for BSS distribution of digital video programming, but it need not be used for the uplink. QPSK is relatively simple and robust, but not particularly spectrally efficient. Depending on the filtering, error correction and other details, it might achieve approximately 1 bit/sec/Hz efficiency. A higher level modulation will result in a lower requirement for spectrum. While QPSK may be acceptable for the BSS downlink, more bandwidth efficient modulation techniques are available. BSS licensees can employ a higher level modulation on the uplink, such as 8-PSK that is being considered by broadcast networks for delivery of digital programming to their affiliate stations. Moreover, DIRECTV supports an advanced modulation that it calls "Type II" modulation, which offers a higher spectral efficiency than QPSK.[57] They can then transcode the signal to QPSK in the satellite for downlink distribution.[58]

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[56]Hughes's Spaceway satellite system and other Ka-band FSS systems claim to improve capacity through frequency reuse. See supra note 9.

[57]See DIRECTV Application, at 34.

[58]General Instrument Corp. has just announced a product to transcode between 8-VSB and 64-QAM modulation. See Multichannel News, July 7, 1997 at 39. Cable systems are already using devices that transcode between QPSK and 64-QAM modulation. Thus, technology to transcode between 8-PSK and QPSK should also be feasible.

D. Alternative Spectrum at 24.65 - 24.75 GHz

It is unrealistic for DIRECTV to assume that the entire 500 MHz in the 17.3-17.8 GHz could be used for BSS downlinks in light of the heavy usage of the 17.7-17.8 GHz band by terrestrial microwave. As noted previously, there are hundreds of microwave links in this 100 MHz band, and the numbers appear to be growing. While the Commission could consider in the future to oust these microwave users, the fact that there is a significant local government and public safety presence (that has already been relocated once to accommodate BBS) suggests that only 400 MHz could be available for a BSS downlink.

As demonstrated above, DIRECTV's purported spectrum needs can be accommodated using less than 300 MHz of feeder link spectrum by using various existing standard techniques. Even if the Commission were to decide that a full 400 MHz of additional spectrum is needed for feeder links, then it should allocate the 100 MHz at 24.65-24.75 GHz in addition to the 300 MHz from 24.75-25.05 GHz. The 24.65-24.75 GHz band is already allocated internationally as a satellite uplink to support feeder links for the Radiolocation-Satellite service. This allocation was proposed to WARC-92 by the United States to support a proposed commercial U.S. satellite system that never has existed, the SAT/TRAC system of Energetics Satellite Corp.[59] Should the Commission consider BSS feeder links in the 24.75-25.05 portion of theband, it must put in place appropriate out-of-band radiation limits to minimize any interference from the high power DIRECTV transmit feeder links into DEMS receivers operating in the adjacent 25.05-25.25 GHz band.

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[59] 1992 WARC Second Notice of Inquiry at 6067.

V. CONCLUSION

For the foregoing reasons, the Commission should dismiss DIRECTV's above-captioned petition for rulemaking.

Respectfully submitted,

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Dated: July 31, 1997

Exhibit 1

Required Separation Distance Between DEMS Nodal Stations and BSS Feeder Link Stations

Parameter	Units	Case 1: ES: 9m, 20 degrees	Case 2: ES: 9m 30 degrees	Case 3: ES: 9m 40 degrees	Case 4: ES: 13m 20 degrees	Case 5: ES: 13m 30 degrees	Case 6: ES: 13m 40 degrees	Comments
Uplink EIRP, clear	dBW	76.1	76.1	76.1	76.1	76.1	76.1	DirecTV Application, p. 42
Uplink Antenna Discrimination	dB	66	70.5	73.5	69.1	73.6	76.6	
Uplink EIRP Toward Terrestrial Station	dBW	10.1	5.6	2.6	7	2.5	-0.5	
Uplink Bandwidth	dBHz	73.8	73.8	73.8	73.8	73.8	73.8	24 MHz DirecTV
Uplink EIRPo to Horizon	dB(W/Hz)	-63.7	-68.2	-71.2	-66.8	-71.3	-74.3	
DEMS Sector Antenna Gain	dBi	23.8	23.8	23.8	23.8	23.8	23.8	
DEMS Noise Temp	dBK	29.1	29.1	29.1	29.1	29.1	29.1	
DEMS Noise Power Density (No)	dB(W/Hz)	-199.5	-199.5	-199.5	-199.5	-199.5	-199.5	4.5 dB NF
Io/No allowable to FSS Interference	dB	-15	-15	-15	-15	-15	-15	3% noise
Max. Received Interference Power Density (Io)	dB(W/Hz)	-214.5	-214.5	-214.5	-214.5	-214.5	-214.5	
Required Path Loss	dB	174.6	170.1	167.1	171.5	167	164	
Free Space Loss	dB	174.6	170.1	167.1	171.5	167.0	164.0	
Atmospheric Loss:	dB	0.0	0.0	0.0	0.0	0.0	0.0	
0	dB/km							
Total Path Loss	dB	174.6	170.1	167.1	171.5	167.0	164.0	
Req'd. Separation Distance	**miles**	**316.2**	**188.4**	**134.7**	**223.3**	**133.0**	**94.1**	

EXHIBIT 2

Radio Service	Number of Licenses, 12/1/96	Number of Licenses, 6/16/97	Six-Month Growth Rate	Comments
Experimental	51	39	-24%	
Broadcast Auxiliary	58	61	5%	
Fixed Common Carrier	158	184	16%	
Temporary-Fixed Common Carrier	259	259	0%	
Operational-Fixed Business	171	201	17%	includes petroleum, power, land transportation
Operational-Fixed Government	99	126	27%	includes portions of networks operated by State of California and City of Los Angeles
Total	796	871	9%	

CERTIFICATE OF SERVICE

I, Kelly N. McCollian, hereby certify that on this 31st day of July, 1997, true and correct copies of the foregoing Joint Opposition to Petition for Rulemaking of DIRECTV Enterprises, Inc. filed by Digital Services Corporation, Microwave Services, Inc., and Teligent, L.L.C. were served by hand delivery or by First Class mail*, postage prepaid, on the following parties:

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